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(54) **VEHICLE AIR-CONDITIONING SEAT**

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(57) **ABSTRACT**

A vehicle air-conditioning seat comprising a blower and a heater therein, wherein at least one of a temperature adjustment region whose temperature is configured to be adjusted by the blower and a temperature adjustment region whose temperature is configured to be adjusted by the heater is divided into a plurality of regions, wherein the vehicle air-conditioning seat has a cool mode where temperature adjustment is performed only by the blower, a heat mode where the temperature adjustment is performed only by the heater, and a mixed mode where the temperature adjustment is performed by both of the blower and the heater, and wherein, in the mixed mode, the temperature adjustment is performed for each divided region by varying at least one of a blowing amount by the blower and a heating amount by the heater for each divided region.

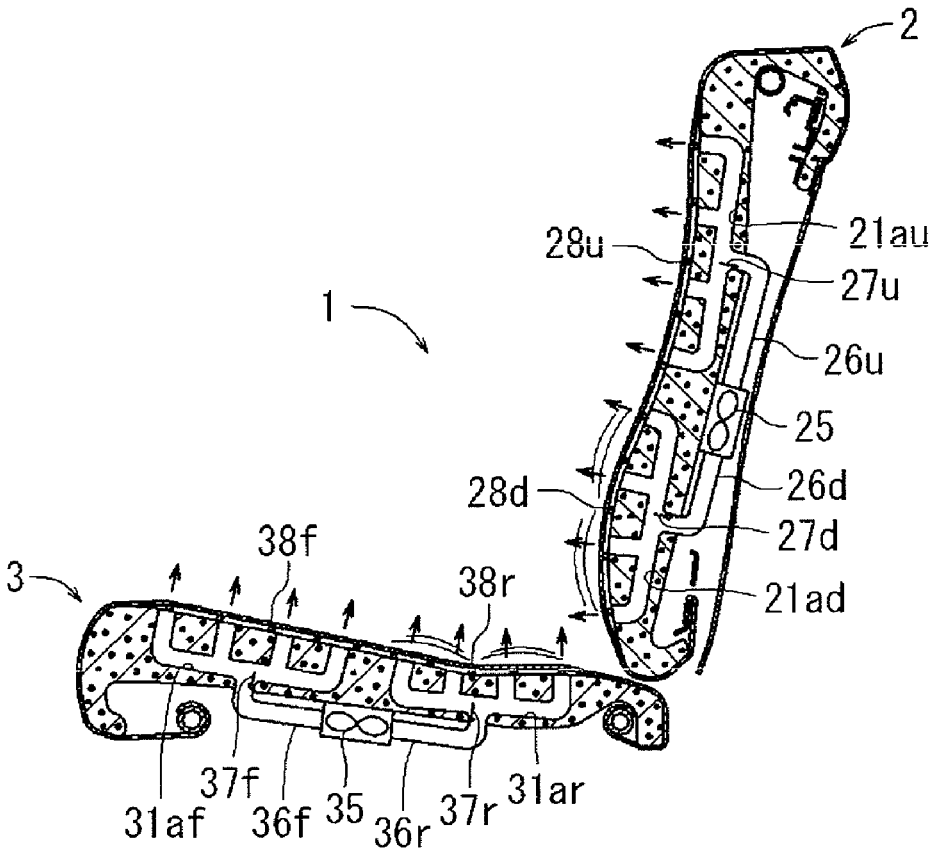

FIG.1

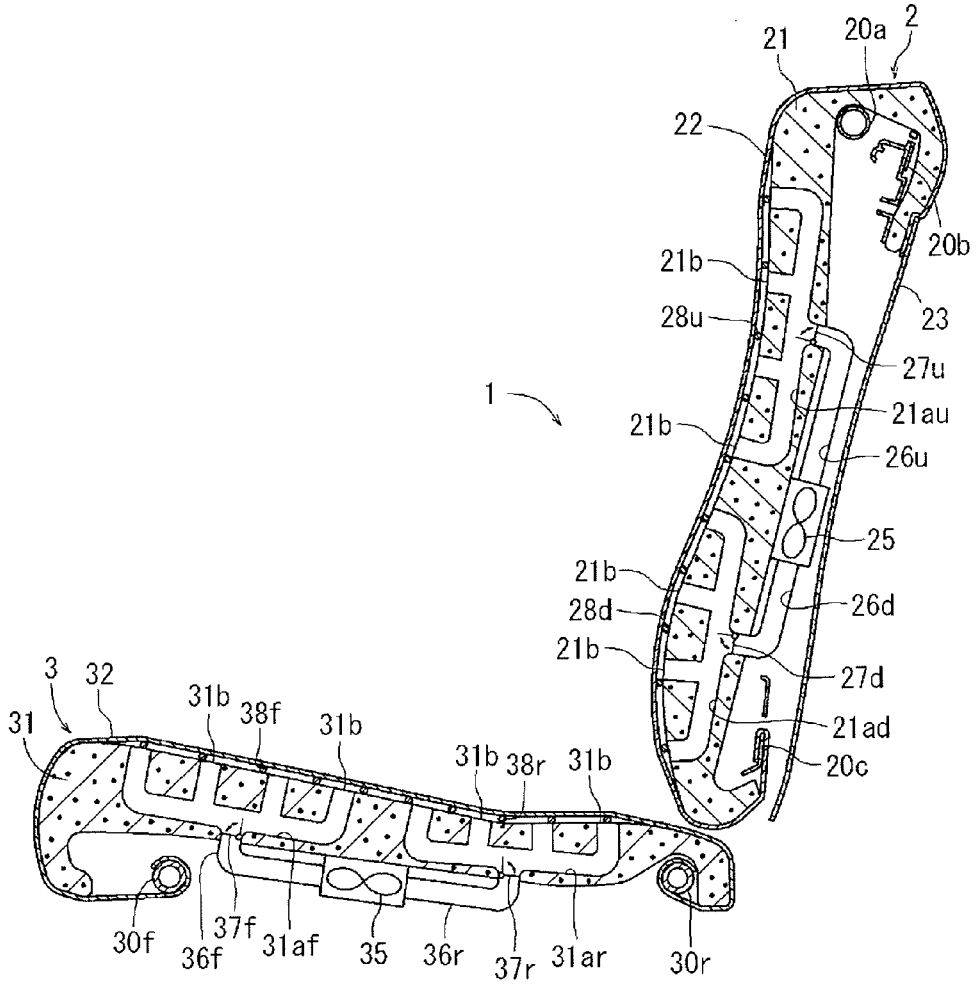
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FIG.2

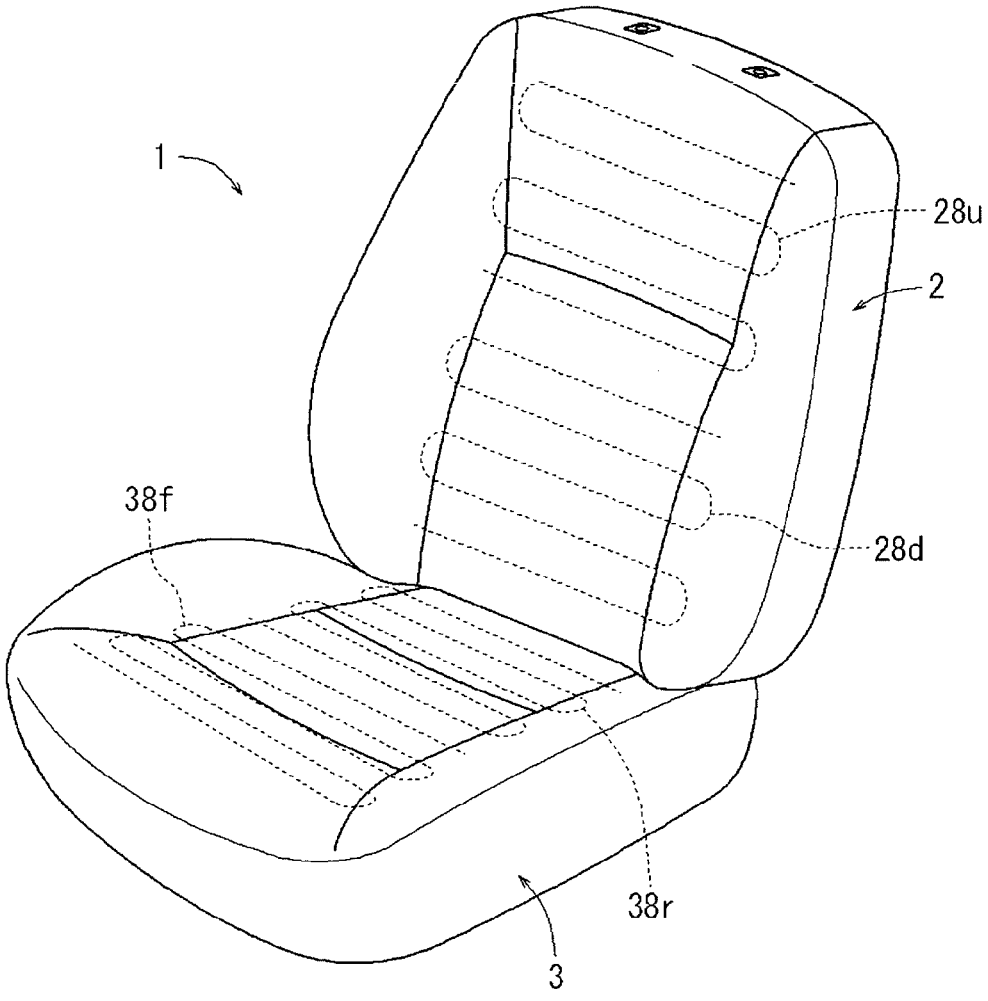

FIG.3

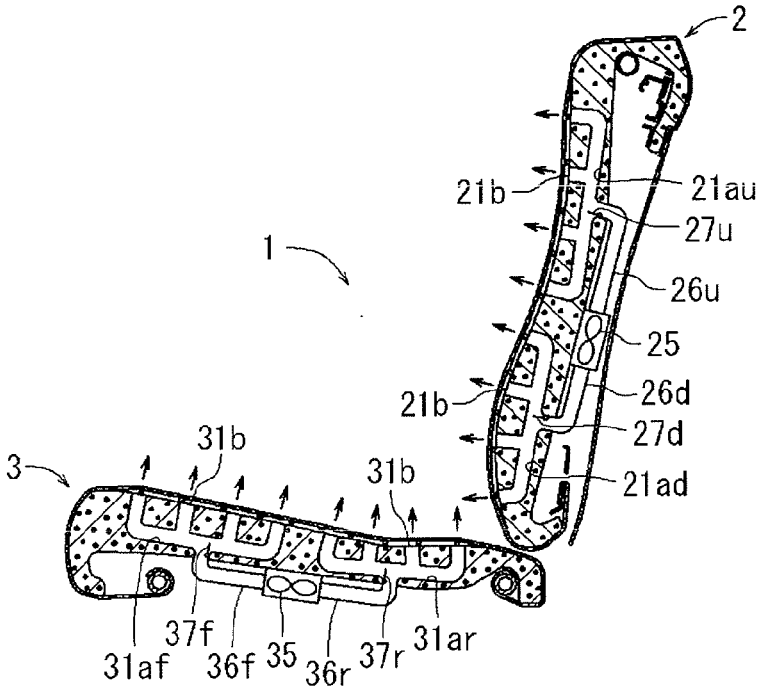
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FIG.4

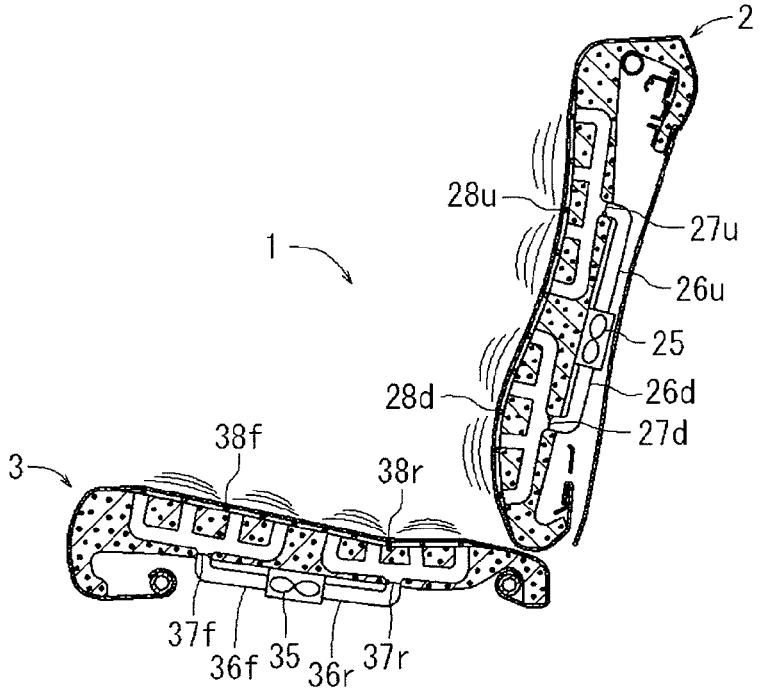
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FIG.5

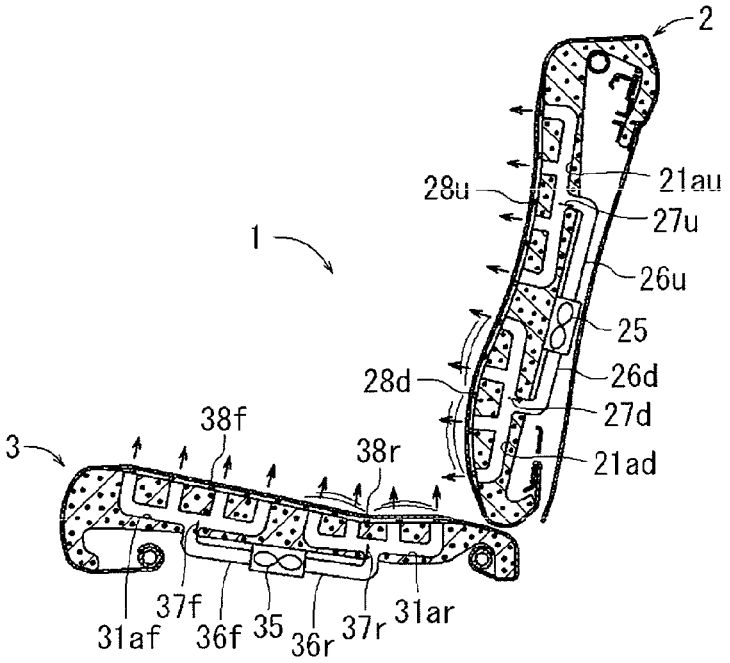
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FIG.6

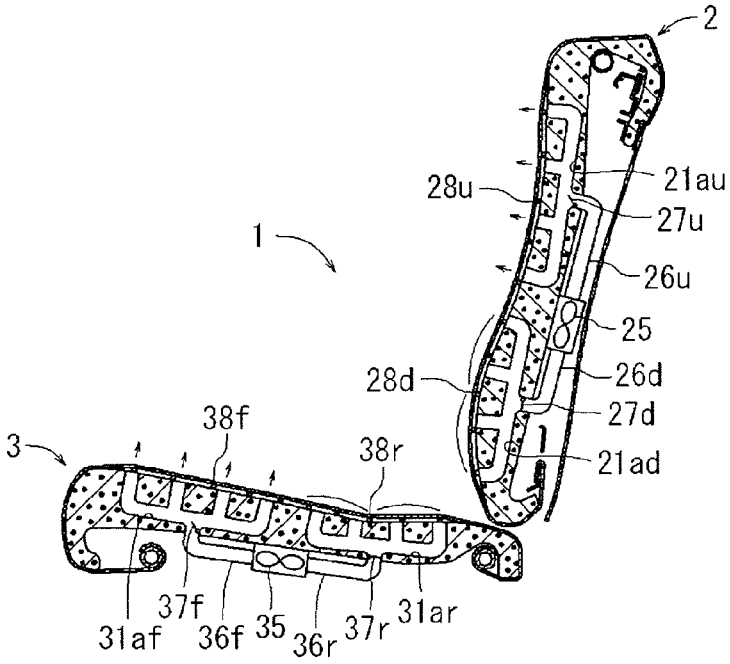
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FIG.7

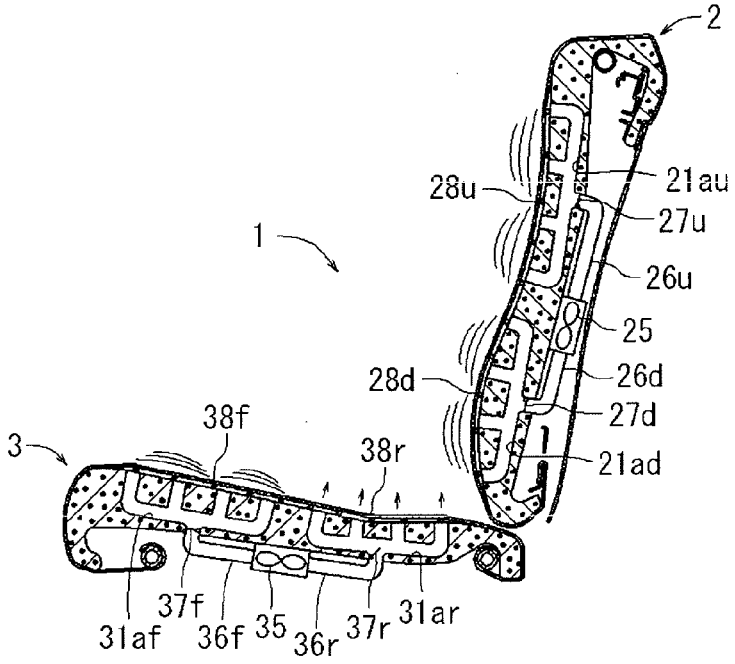
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FIG.8

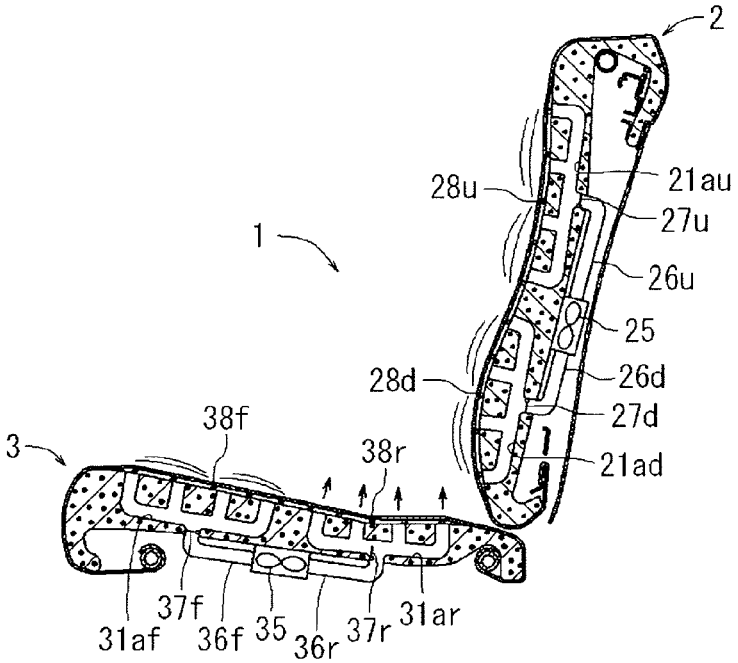
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FIG.9

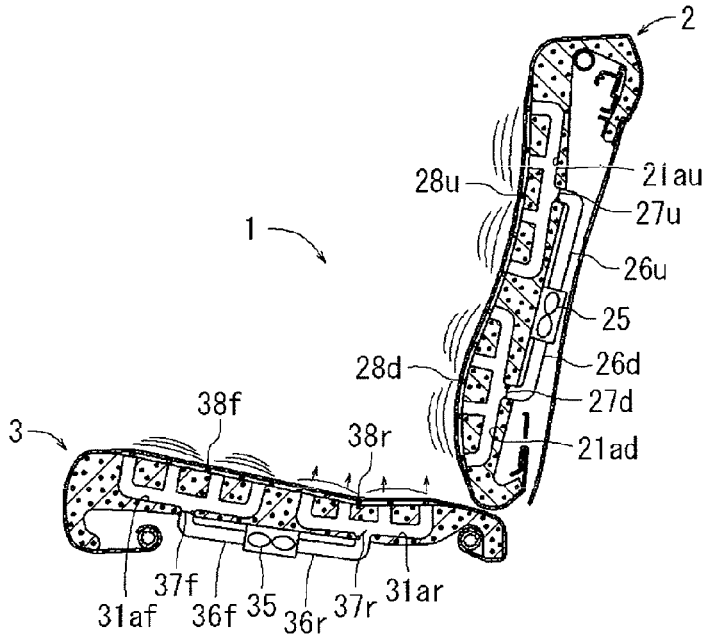
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FIG.10

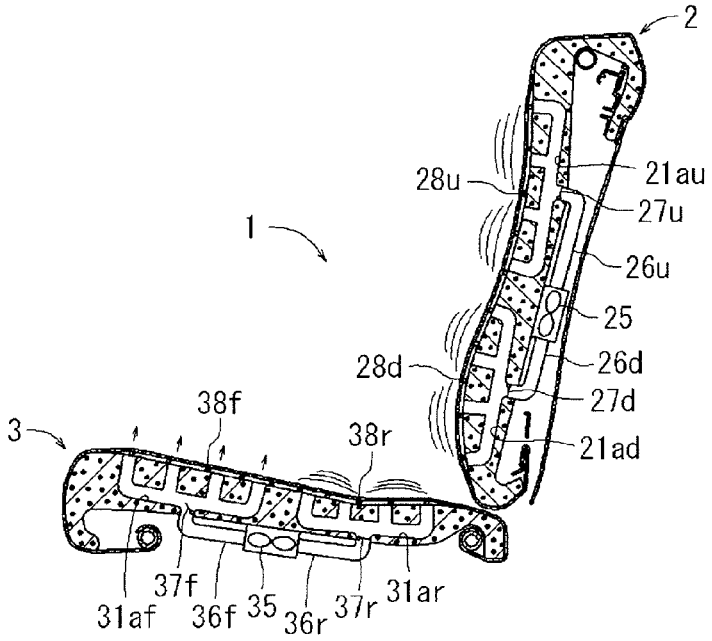
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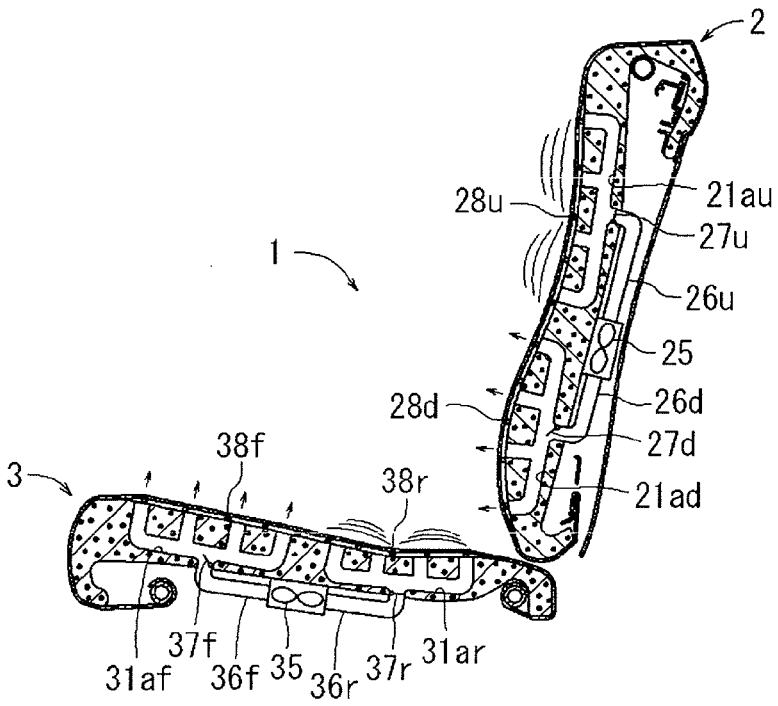
FIG.11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VEHICLE AIR-CONDITIONING SEAT

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority from Japanese Patent Application No. 2015-106637 filed on May 26, 2015, the entire contents of which are incorporated herein by reference.

TECHNICAL FIELD

[0002] The present disclosure relates to a vehicle air-conditioning seat having a blower and a heater therein.

BACKGROUND

[0003] A vehicle air-conditioning seat having a blower and a heater therein is disclosed in JP-A-2003-237354, for example. In JP-A-2003-237354, an electric heater and a blowing unit are incorporated in the interior of a seat back and a seat cushion, respectively. A seat cover can be heated by the electric heater, and at the same time, the blowing air of the blowing unit can be blown-out from a blow-out opening provided in the seat cover. At this time, in order to prevent an occupant from feeling that the seat is too hot or too cold by the vehicle cabin environment, a heating amount by the electric heater and a blowing amount from the blowing unit can be respectively adjusted by one operation means.

[0004] That is, the vehicle air-conditioning seat disclosed in JP-A-2003-237354 basically has two modes of a cool mode mainly using the blowing unit and a heat mode mainly using the electric heater. In addition, in order to prevent superheating or supercooling in each mode, the blowing unit or the electric heater is auxiliarily used in combination, as necessary. In JP-A-2003-237354, the temperature in the entire surface of the seat cushion and the seat back is uniformly adjusted.

[0005] In this kind of vehicle air-conditioning seat, the cool mode is used in summer and the heat mode is used in winter. The vehicle air-conditioning seat is hardly used in spring or autumn. When the vehicle air-conditioning seat is used in spring or autumn, an occupant's body becomes too cold or stuffy, thereby causing discomfort. In JP-A-2003-237354, the supercooling in the cool mode and the superheating in the heat mode can be avoided depending on the vehicle cabin environment. However, JP-A-2003-237354 does not go beyond the range of the cool mode and the heat mode, and hence, the vehicle air-conditioning seat is assumed to be hardly used in spring or autumn. Accordingly, the advantage of mounting the vehicle air-conditioning seat cannot be sufficiently utilized.

SUMMARY

[0006] Aspects of the present disclosure provide a vehicle air-conditioning seat having a mode which can be comfortably used also in spring or autumn.

[0007] According to an aspect of the disclosure, there is provided a vehicle air-conditioning seat comprising a blower and a heater therein, wherein at least one of a temperature adjustment region whose temperature is configured to be adjusted by the blower and a temperature adjustment region whose temperature is configured to be adjusted by the heater is divided into a plurality of regions, wherein the vehicle air-conditioning seat has a cool mode where temperature adjustment is performed only by the blower, a heat mode where the temperature adjustment is performed only by the heater, and a mixed mode where the temperature adjustment is performed by both of the blower and the heater, and wherein, in the mixed mode, the temperature adjustment is performed for each divided region by varying at least one of a blowing amount by the blower and a heating amount by the heater for each divided region.

BRIEF DESCRIPTION OF DRAWINGS

[0008] FIG. **1** is a schematic sectional view of a vehicle air-conditioning seat;

[0009] FIG. **2** is a perspective view of the vehicle air-conditioning seat;

[0010] FIG. **3** is a schematic view showing a cool mode of the vehicle air-conditioning seat;

[0011] FIG. **4** is a schematic view showing a heat mode of the vehicle air-conditioning seat;

[0012] FIG. **5** is a schematic view showing a cold-prevention mode of the vehicle air-conditioning seat;

[0013] FIG. **6** is a schematic view showing a weak cold-prevention mode of the vehicle air-conditioning seat;

[0014] FIG. **7** is a schematic view showing a stuffiness-prevention mode of the vehicle air-conditioning seat;

[0015] FIG. **8** is a schematic view showing a strong stuffiness-prevention mode of the vehicle air-conditioning seat;

[0016] FIG. **9** is a schematic view showing a weak stuffiness-prevention mode of the vehicle air-conditioning seat;

[0017] FIG. **10** is a schematic view showing another example of a strong stuffiness-prevention mode of the vehicle air-conditioning seat; and

[0018] FIG. **11** is a schematic view showing yet another example of strong stuffiness-prevention mode of the vehicle air-conditioning seat.

DETAILED DESCRIPTION

[0019] An air-conditioning seat of the present disclosure can be applied to seats of various vehicles such as a train such as a tram or a Shinkansen, an airplane and a vessel, in addition to a vehicle such as an automobile. An air-conditioning seat **1** of the present embodiment has a seat back **2** serving as a backrest of an occupant and a seat cushion **3** serving as a seating portion of the occupant, as shown in FIG. **1** and the like.

[0020] The seat back **2** has a back frame constituting a framework and made of metal, a back pad **21** serving as a cushion material and made of foam resin, and a back cover **22** for covering an outer surface of the back pad **21**. An upper frame **20***a*, an upper panel **20***b* and a lower frame **20***c* of the back frame are shown in Fig. I and the like. The upper frame **20***a* integrally connects upper ends of left and right side frames (not shown) to each other. The upper panel **20***b* is installed between the upper ends of the left and right side frames (not shown). The lower frame **20***c* is installed between lower ends of the left and right side frames (not shown). A reference numeral **23** represents a rear panel covering a rear surface of the seat back **2** and made of synthetic resin.

[0021] A blowing fan **25** as a blower is incorporated in the interior of the seat back **2**. Specifically, the blowing fan **25** is arranged at an internal space between the back pad **21** and the rear panel **23**. The blowing fan **25** can be fixedly installed

to the back pad **21** or the rear panel **23**. Alternatively, the blowing fan **25** may be fixed to a portion of the back frame by using a dedicated bracket or stay, etc. The blowing fan **25** is not particularly limited, so long as it can be driven by energization to forcibly flow gas. Specifically, any one of an air supply (blow-out) fan or an intake (suction) fan may be used. Alternatively, a fan where air supply and intake can be switched may be used. Although not shown, the blowing fan **25** is electrically connected to a power source (battery) via a cable.

[0022] In the interior of the back pad **21**, a series of air passages are formed in a branched shape over the entire surface direction of the back pad **21**. In a front surface (seating surface) of the back pad **21**, a plurality of openings **21***b* communicating with the air passages is formed on the entire front surface. Here, in the present embodiment, the air passages are divided into two upper and lower regions in order to separate a temperature adjustment region by the blowing fan **25**. Specifically, the air passages are divided into an upper air passage **21***au* for adjusting the temperature of an upper region of the seat back **2** and a lower air passage **21***ad* for adjusting the temperature of a lower region of the seat back **2**. The upper air passage **2***l* au corresponds to the surroundings of an occupant's scapula. The lower air passage **21** ad corresponds to the surroundings of an occupant's waist. The upper air passage **21***au* and the lower air passage **21***ad* are independent of each other. The upper air passage **2***l* au and the lower air passage **21***ad* communicate with the blowing fan **25** via an upper duct **26***u* and a lower duct **26***d*, respectively. In the interior of the upper duct **26***u* and the lower duct **26***d*, a shutter **27***u* and a shutter **27***d* for switching a communicating state and a cut-off state of the upper duct **26***u* and the lower duct **26***d* are disposed respectively. The switching of the shutter **27***u* and the shutter **27***d* is controlled by an air-conditioning control device.

[0023] The back cover **22** is made of a leather material or a fabric. When the back cover **22** is made of the leather material, there is no air permeability, and hence, a large number of small holes are formed on the entire surface to secure the air permeability. When the back cover **22** is made of the fabric, the air permeability is secured by the gaps between fibers, and hence, there is no need to purposely provide small holes.

[0024] A heater is provided between the back pad **21** and the back cover **22**. A heating wire which generates heat by energization can be suitably used as the heater. The heating wire is routed on the entire front surface of the seat back **2**. In the present embodiment, the heating regions by the heater are also divided into two upper and lower regions. Specifically, as shown also in FIG. **2**, the heater is divided into an upper heater **28***u* for adjusting the temperature of an upper region of the seat back **2** and a lower heater **28***d* for adjusting the temperature of a lower region of the seat back **2**. The upper heater **28***u* corresponds to the surroundings of an occupant's scapula, together with the upper air passage **21** au. The lower heater **28***d* corresponds to the surroundings of an occupant's waist, together with the lower air passage **21***ad*. The upper heater **28***u* and the lower heater **28***d* are independent of each other. Although not shown, the upper heater **28***u* and the lower heater **28***d* are electrically connected to a power source (battery: not shown) via a cable, respectively.

[0025] Referring back to FIG. **1**, the seat cushion **3** has a cushion frame constituting a framework and made of metal, a cushion pad **31** serving as a cushion material and made of foam resin, and a cushion cover **32** for covering an outer surface of the cushion pad **31**. A front pipe **30***f* and a rear pipe **30***r* of the cushion frame are shown in FIG. **1** and the like. The front pipe **30***f* is installed between front end as of the left and right side frames (not shown). The rear pipe **30***r* is installed between rear ends of the left and right side frames (not shown). A front edge of the cushion cover **32** is locked to the front pipe **30***f*. A rear edge of the cushion cover **32** is locked to the rear pipe **30***r*.

[0026] A blowing fan **35** as a blower is incorporated in the interior of the seat cushion **3**. Specifically, the blowing fan **35** is arranged in a lower space of the cushion pad **31**. The blowing fan **35** may be fixedly installed to the cushion pad **31**, or, may be fixed to a portion of the cushion frame by using a dedicated bracket or stay, etc. The same one as the blowing fan **25** used in the seat back **2** may be used as the blowing fan **35**. Although not shown, the blowing fan **35** is electrically connected to a power source (not shown) via a cable.

[0027] In the interior of the cushion pad **31**, a series of air passages are formed in a branched shape over the entire surface direction of the cushion pad **21**. In an upper surface (seating surface) of the cushion pad **31**, a plurality of openings **61***b* communicating with the air passages is formed on the entire upper surface. Here, in the present embodiment, the air passages are divided into two front and rear regions in order to separate a temperature adjustment region by the blowing fan **35**. Specifically, the air passages are divided into a front air passage **31***af* for adjusting the temperature of a front region of the seat cushion **3** and a rear air passage **31***ar* for adjusting the temperature of a rear region of the seat cushion **3**. The front air passage **31** of corresponds to the surroundings of an occupant's thigh. The rear air passage **31** ar corresponds to the surroundings of an occupant's hip. The front air passage **31** of and the rear air passage **31***ar* are independent of each other. The front air passage **31** of and the rear air passage **31***ar* communicate with the blowing fan **35** via a front duct **36***f* and a rear duct **36***r*, respectively. In the interior of the front duct **36***f* and the rear duct **36***n* a front shutter **37***f* and a rear shutter **37***r* for switching a communicating state and a cut-off state of the front duct **36***f* and the rear duct **36***r* are disposed respectively. The switching of the front shutter **37***f* and the rear shutter **37***r* is controlled by the air-conditioning control device.

[0028] The same one as the back cover **22** may be used as the cushion cover **32**. Further, a heater is provided between the cushion pad **31** and the cushion cover **32**. A heating wire which generates heat by energization can be suitably used as the heater. The heating wire is routed on the entire upper surface of the seat cushion **3**. Further, in the present embodiment, the heating regions by the heater are also divided into two front and rear regions. Specifically, as shown also in FIG. **2**, the heater is divided into a front heater **38***f* for adjusting the temperature of a front region of the seat cushion **3** and a rear heater **38***r* for adjusting the temperature of a rear region of the seat cushion **3**. The front heater **38***f* corresponds to the surroundings of an occupant's thigh, together with the front air passage **31***af*. The rear heater **38***r* corresponds to the surroundings of an occupant's hip, together with the rear air passage **31***ar*. The front heater **38***f* and the rear heater **38***r* are independent of each other.

Although not shown, the front heater **38***f* and the rear heater **38***r* are electrically connected to a power source (not shown) via a cable, respectively.

[0029] The air-conditioning control device includes a well-known microcomputer composed of a CPU, ROM and RAM, etc., and peripheral circuits thereof. A control program for controlling the air-conditioning is stored in the ROM. The CPU executes various computations on the RAM, based on the control program stored in the ROM.

[0030] The air-conditioning of the air-conditioning seat I can be carried out by an operation switch (not shown) corresponding to each mode. The operation switch can be provided in the side of the air-conditioning seat **1** or an instrument panel, etc. Alternatively, the air-conditioning seat may be configured to be operated on a display screen of a car navigation system. Operation signal from each operation switch is inputted to the air-conditioning control device. Based on the operation signal inputted, necessary operation signal is outputted from the air-conditioning control device to the blowing fans **25**, **35** or the heaters **28***u*, **28***d*, **38***f*, **38***r*, etc.

[0031] In the present embodiment, a cool mode where an occupant's sensible temperature is adjusted only by the blowing fans **25**, **35**, a heat mode where the occupant's sensible temperature is adjusted only by the heaters **28**, **38**, and a mixed mode where the cool mode and the heat mode are used in combination in some regions are set.

[0032] The cool mode is a mode that is mainly used in summer. As shown in FIG. **3**, in the cool mode, all of the shutters **27***u*, **27***d*, **37***f*, **37***r* are opened. In this way, all of the ducts **26***u*. **26***d*, **36***f*, **36***r* are in the communicating state. Then, both of the blowing falls **25**, **35** are driven. Thus, air flows in all of the openings **21***b*, **31***b* through each of the air passages **21***au*, **21***ad*, **31***af*, **31***ar*. In this way, an occupant feels the coolness over the entire seating surface of the seat back **2** and the seat cushion **3**.

[0033] Here, the operation switch for the cool mode may be provided with a strong and weak button or a dedicated operation dial or the like, so that a flow rate of air may be changed. Further, the blowing fans **25**, **35** may be an air supply fan or an intake fan. That is, the, blowing fans **25**, **35** may be configured such that air is blown-out from the openings **21***b*, **31***b* or sucked from the openings **21***b*, **31***b*. The reason is that, in either case, the occupant feels coolness. In FIGS. **3** to **11** showing respective modes, an aspect where air is blown-out from the openings **21***b*, **31***b* is illustrated.

[0034] The heat mode is a mode that is mainly used in winter. As shown in FIG. **4**, in the heat mode, all of the shutters **27***u*, **27***d*, **37***f*, **37***r* are closed and all of the ducts **26***u*, **26***d*, **36***f*, **36***r* are cut off. Then, all of the heaters **28***u*, **28***d*, **38***f*, **38***r* are energized. In this way, the entire seating surface of the seat back **2** and the seat cushion **3** is heated, so that an occupant feels warmth. Here, also in the heat mode, the operation switch for the heat mode may be provided with a strong and weak button or a dedicated operation dial or the like, so that the amount of heating may be changed.

[0035] As the mixed mode, for example, a cold-prevention mode as shown in FIG. **5** can be set. The cold-prevention mode is a mode that is used in a relatively warm period in spring or autumn. In the cold-prevention mode, basically, the cool mode is mainly used and the heater is used in combination in some regions. Specifically, the air-conditioning is performed over the entire seating surface of the seat back **2** and the seat cushion **3**, and the lower heater **28***d* provided in the lower region of the seat back **2** and the rear heater **38***r* provided in the rear region of the seat cushion **3** are energized. In this way, the supercooling is prevented in the portion from the waist to the hip of the occupant. Therefore, it is possible to comfortably use the air-conditioning function without the discomfort that an occupant's body is cooled more than necessary.

[0036] Also in the cold-prevention mode, a strong and weak mode can be set by a strong and weak button or the like. For example, when a weak cold-prevention mode is set, as shown in FIG. **6**, the amount of air-conditioning is suppressed in the upper region of the seat back **2** and the front region of the seat cushion **3** whereas the air-conditioning is stopped in the lower region of the seat back **2** and the rear region of the seat cushion **3**. For this purpose, the opening amount of the upper duct **26***u* and the front duct **36***f* may be suppressed by the upper shutter **27***u* and the front shutter **37***f*. On the other hand, the lower duct **26***d* and the rear duct **36***r* are still closed by the lower shutter **27***d* and the rear shutter **37***r*. Instead, the air-conditioning seat can be configured to be slightly heated by supplying a small amount of electricity to the lower heater **28***d* and the rear heater **38***r*.

[0037] Further, as the mixed mode, a stuffiness-prevention mode may be set. The stuffiness-prevention mode is a mode that is used in a relatively cool period in spring or autumn. In the stuffiness-prevention mode, basically, the heat mode is mainly used and the air-conditioning by the blower is used in combination in some regions. For example, as shown in FIG. **7**, the entire seating surface of the seat back **2** and the front region of the seat cushion **3** are heated by the heaters **28***u*, **28***d* and **38***f*, respectively. On the other hand, the rear region of the seat cushion **3** is air-conditioned by the blowing fan **35**. At this time, the ducts **26***u*, **26***d*, **36***f* are cut off by the shutters **27***u*, **27***d*, **37***f* and only the rear duct **36***r* is communicated by the rear shutter **37***r*. In this way, while an occupant basically feels the warmth, only the hip which becomes easily stuffy is air-conditioned, and therefore, an occupant can comfortably use the air-conditioning function.

[0038] Further, also in the stuffiness-prevention mode, a strong and weak mode can be set by a strong and weak button or the like. For example, when a strong stuffiness-prevention mode is set, as shown in FIG. **8**, it is possible to increase the ventilation amount from the blowing fan **35** while suppressing the heating amount by the heaters **28***u*, **28***d*, **38***f*. In this way, the stuffiness-prevention effect is increased. On the other hand, when a weak stuffiness-prevention mode is set, for example, as shown in FIG. **9**, slight air-conditioning and slight heating can be used in combination in the rear region of the seat cushion **3**. In this way, it is possible to suppress the stuffiness-prevention function.

[0039] The stuffiness-prevention mode may be set such that the portion other than the hip is prevented from being stuffy. For example, as shown in FIG. **10**, in order to prevent the surroundings of the thigh of the occupant from being stuffy, the stuffiness-prevention mode may be set such that only the front portion of the seat cushion **3** is air-conditioned. Further, the stuffiness-prevention mode may be set such that not only one region but also a plurality of regions is simultaneously prevented from being stuffy. For example, as shown in FIG. **11**, the stuffiness-prevention mode may be

set such that the surroundings of the thigh and the surroundings of the waist of the occupant are simultaneously air-conditioned.

[0040] In addition, the mixed mode is not limited to the aspects shown in FIGS. **5** to **11** but can have various combinations. In this case, whether an occupant feels a cool sensible temperature or a warm sensible temperature is determined depending on whether the sensible temperature is higher or lower than the body temperature. Therefore, this may be set as a reference. Further, the mixed mode may be set such that the states shown in FIGS. **7**, **10** and **11** are automatically switched at regular intervals.

[0041] Further in the above embodiment the seating surface of the seat back **2** or the seat cushion **3** is divided into two regions. However, the seating surface of the seat back **2** or the seat cushion **3** may be finely divided into three or more regions. In this case, the number of regions divided in the seat back **2** may be different from the number of regions divided in the seat cushion **3**. It is sufficient that at least one of a temperature adjustment region by the blowing fans and a temperature adjustment region by the heaters is divided into a plurality of regions. Therefore, any one of the temperature adjustment regions by the blowing fans or the temperature adjustment regions by the heaters may not be divided. Further, in the above embodiment, one blowing fan **25**, **35** is shared in a plurality of regions. However, a blower may be provided for each divided region. In this case, a shutter for opening and closing each duct is not required.

[0042] The disclosure provides illustrative, non-limiting aspects as follows:

[0043] According to an aspect of the disclosure, there is provided a vehicle air-conditioning seat comprising a blower and a heater therein, wherein at least one of a temperature adjustment region whose temperature is configured to be adjusted by the blower and a temperature adjustment region whose temperature is configured to be adjusted by the heater is divided into a plurality of regions, wherein the vehicle air-conditioning seat has a cool mode where temperature adjustment is performed only by the blower, a heat mode where the temperature adjustment is performed only by the heater, and a mixed mode where the temperature adjustment is performed by both of the blower and the heater, and wherein, in the mixed mode, the temperature adjustment is performed for each divided region by varying at least one of a blowing amount by the blower and a heating amount by the heater for each divided region.

[0044] Accordingly, the vehicle air-conditioning seat has the mixed mode where the temperature adjustment is performed by a combination of the blower and the heater, in addition to the cool mode where the temperature adjustment is performed only by the blower and the heat mode where the temperature adjustment is performed only by the heater. Therefore, the mixed mode where the temperature adjustment is performed for each region according to the season can be comfortably used also in spring or autumn, while using the cool mode in summer and the heat mode in winter as in the related art. That is, since the vehicle air-conditioning seat can be comfortably used also in spring or autumn, the advantage of mounting the vehicle air-conditioning seat can be utilized sufficiently.

What is claimed is:

1. A vehicle air-conditioning seat comprising a blower and a heater therein,

wherein at least one of a temperature adjustment region whose temperature is configured to be adjusted by the blower and a temperature adjustment region whose temperature is configured to be adjusted by the heater is divided into a plurality of regions,

wherein the vehicle air-conditioning seat has a cool mode where temperature adjustment is performed only by the blower, a heat mode where the temperature adjustment is performed only by the heater, and a mixed mode where the temperature adjustment is performed by both of the blower and the heater, and

wherein, in the mixed mode, the temperature adjustment is performed for each divided region by varying at least one of a blowing amount by the blower and a heating amount by the heater for each divided region.

2. The vehicle air-conditioning seat according to claim **1**,

wherein the mixed mode includes a cold-prevention mode where the cool mode by the blower is mainly used and the heater is used in combination in some regions.

3. The vehicle air-conditioning seat according to claim **1**,

wherein the mixed mode includes a stuffiness-prevention mode where the heat mode by the heater is mainly used and the blower is used in combination in some regions.

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